[The Annunciation, from the Baptistery Gates, and Portrait of Ghiberti.]

ESSAYS ON THE LIVES OF REMARKABLE PAINTERS.—No. IX.

THE GATES OF SAN GIOVANNI.

We are now to enter on a view of the progress of painting in the fifteenth century—a period perhaps the most remarkable in the whole history of mankind; distinguished by the most extraordinary mental activity, by rapid improvement in the arts of life, by the first steady advance in philosophical inquiry, by the restoration of classical learning, and by two great events, of which the results lie almost beyond the reach of calculation—the invention of the art of printing, and the discovery of America.

The progressive impulse which characterised this memorable period was felt not less in the fine arts: in painting, the adoption of oils in the mixing of colours, instead of the aqueous and glutinous vehicles formerly used for the purpose, led to some most important results. But long before the general adoption of this and other improvements in the *materials* employed, there had been a strong impulse given to the mental development of art, of which we have to say a few words before we come to treat further of the history and efforts of individual minds.

During the fourteenth century we find all Italy filled with the scholars and imitators of Giotto, but in the fifteenth there was a manifest striving after originality of style; a branching off into particular schools, distinguished by the predominance of some particular characteristic in the mode of treatment:—as expression; form; colour; the tendency to the merely imitative; or the aspiration towards the spiritual and ideal. At this time we begin to hear of the Neapolitan, Umbrian, Bolognese, Venetian, and Paduan schools as distinctly characterised; but from 1400 to 1450 we still find the Tuscan schools in advance of all the rest, in power, invention, fertility, and in the application of knowledge and mechanical means to a given end: and as in the thirteenth century we traced the new influence given to modern art by Giotto back to the sculptor Nicola Pisano, so in the fifteenth century we find the influence of another sculptor, Lorenzo Ghiberti, producing an effect on his contemporaries, more especially his fellow-citizens, which, by developing and perfecting the principles of imitation on which

Giotto had worked, stamped that peculiar character on Florentine art which distinguished it all through the century of which we have now to speak, and the beginning of the next.

For these reasons, the story of Ghiberti, and the casting of the famous gates of San Giovanni, may be considered as an epoch in the history of painting: we shall find, as we proceed, almost every great name, and every important advance in art, connected with it directly or indirectly, while the competition which is about to take place among our own artists, with a view to the decoration of the houses of Parliament, lends, at the present moment, a particular interest and application to this beautiful anecdote.

Florence, at the period of which we speak, was at the head of all the states of Italy, and at the height of its prosperity. The government was essentially democratic in spirit and form; every class and interest in the state, the aristocracy, the military, merchants, tradesmen, and mechanics, had each a due share of power, and served to balance each other. The family of the Medici, who a century later seized on the sovereignty, were at this time only among the most distinguished citizens, and members of a great mercantile house, at the head of which was Giovanni, the father of Cosmo de' Medici. The trades were divided into guilds or companies, called Arti, which were represented in the government by twenty-four Consoli, or consuls. It was these consuls of the guild of merchants, who, in the year 1401, undertook to erect a second gate or door of bronze to the Baptistery of St. John, which should form a pendant to the first, executed in the preceding century (1330), by Andrea Pisano, from the designs of Giotto, and representing in rich sculpture the various events of the life of St. John the Baptist.* To equal or surpass this beautiful gate, which had been for half a century the admiration of all Italy, was the object proposed, and no expense was to be spared in its attainment.

The *Signoria*, or members of the chief government, acting in conjunction with the *Consoli*, made known their munificent resolve through all Italy, and in consequence, not only the best artists of Florence, but many from other cities, particularly Siena and Bologna, assembled on this occasion. From among a great number, seven were selected by the *Consoli* as worthy to compete for the work, upon terms not merely just, but munificent. Each competitor received, besides his expenses, a fair indemnity for his labour for one year. The subject proposed was the Sacrifice of Isaac, and at the end of the year each artist was required to give in a design, executed in bronze, of the same size as one of the compartments of the old gate, that is, about two feet square.†

There were thirty-four judges, principally artists, some natives of Florence, others strangers; each was obliged to give his vote in public, and to state at the same time the reasons by which his vote was justified. The names of the seven competitors, as given by Vasari, were — Jacopo della Quercia, of Siena; Nicolo d'Arezzo, his pupil; Simon da Colle, celebrated already for his fine workmanship in bronze, from which he was surnamed Simon *dei Bronzi;* Francesco di Valdambrina; Filippo Brunelleschi; Donato, better known as Donatello; and Lorenzo Ghiberti.

Lorenzo was at this time about twenty-three; he was the son of a Florentine named Cione, and of a family which had attained to some distinction in Florence. The mother of Lorenzo, left a widow at an early age, married a worthy man named Bartoluccio, known for his skill as a goldsmith. The goldsmiths of those days were not merely *artisans*, but artists in the high sense of the word; they generally wrought their own designs, consisting of figures and subjects from sacred or classical story, exquisitely chased in relief, or engraved or enamelled on the shrines or chalices used in the church service; or vases, dishes, sword-hilts, and other implements.

The arts of drawing and modelling, then essential to a goldsmith, as well as practical skill in chiselling, and founding and casting metals, were taught to the young Lorenzo by his father-in-law; and his progress was so rapid, that at the age of nineteen or twenty he had already secured to himself the patronage of the Prince Pandolfo Malatesta, Lord of Pesaro, and was employed in the decoration of his palace, when Bartoluccio sent him notice of the terms of the competition for the execution of the gates of San Giovanni. Lorenzo immediately hastened to present himself as one of the competitors, and, on giving evidence of his acquired skill, he was accepted among the elected seven. They had each their workshop and furnace apart, and it is related that most of them jealously kept their designs secret from the rest: but Lorenzo, who had all the modest self-assurance of conscious genius, did not; on the contrary, he listened gratefully to any suggestion or criticism which was offered, admitting his friends and distinguished strangers to his *atelier* while his work was going forward. To this candour he added a persevering courage; for when, after incredible labour, he had completed his models, and made his preparations for casting, some flaw or accident in the process obliged him to begin all over again: he supplied this loss of time by the most unremitting labour, and at the end of the year he was not found behind his competitors. When the seven pieces were exhibited together in public, it was adjudged that the work of Quercia was wanting in delicacy and finish; that that of Valdambrina was confused in composition; that of Simon da Colle well cast, but ill drawn; that of Nicolo d'Arezzo, heavy and ill-proportioned in the figures, though well composed: in short, but three among the number united the various merits of composition, design, and delicacy of workmanship, and were at once preferred before the rest. These three were the work of Brunelleschi, then in his twenty-fifth year; Donatello, then about eighteen; and Lorenzo Ghiberti, not quite twenty-three. The suffrages seemed divided; but after a short pause, and the exchange of a few whispered words, Brunelleschi and Donatello withdrew, generously agreeing and proclaiming aloud that Lorenzo had excelled them all, that to him alone belonged the prize; and this judgment, as honourable to themselves as to their rival, was confirmed amid the acclamations of the assembly.

[To be continued.]

* A Baptistery, as its name imports, is an edifice used for the purposes of baptism, and always dedicated to St. John the Baptist. The Baptistery of San Giovanni at Florence is a large chapel of an octangular form, surmounted by a dome: on three of the sides are entrances. It is an appendage of the cathedral, though separate from it.

† The peculiar form of the compartment may be seen in the engraving at the head of this essay.

THE PUNA AND THE MINES OF LA RIOJA.

[From the Narrative of J. O. French, Esq., in the Geographical Journal.]

The climate of the Morado is mild in comparison with that of the other great central elevations of the chain, both in respect to cold, and to the still more important circumstance of the *puna*, of which I shall presently speak. One almost continuous elevation, called the Rosario, connects the Morado and the Cerro Negro and Cerro Cienega; between these and the Nevado lie the ranges severally called the Valletos, the Tigre, and

the Mexicana: the latter is perhaps within 300 feet of the height of the Nevado itself; the summits of the Cerro Negro, Morado, some part of the Valletos and the Tigre nearly equal in height that of the Mexicana. Ascending the great northern quebrada, termed the Escaleras, or ladder, from its long-continued ascent by ravines and terraces, to the bases of the central elevations, a distance of 12 leagues from the trapeche or mill of the Escaleras is traversed. The region of lichens and mosses is finally arrived at in the upper ravines; and here the central elevations rise steeply, and often inaccessibly, from 700 to 800 or 1500 feet. This is the region of the condors, which, when glutted with the carcass of some dead mule, may be easily approached. Here also I observed a small active quadruped resembling the fox, scaling the rocks above the region of vegetation. At the northern edge of the Valletos occurs the *Cueva de Perez*, whence a ravine branches off to the right to the base of the Mexicana, which here presents a broad and very steep face, about 1000 feet in height, on which huts and entrances to mines may be seen at various elevations. A little way up the ravine from the cave some ancient Indian mining works exist; and here the *puna* begins to be sensibly felt, increasing as the ravine is ascended. At the entrance of this northern gorge of the Famatina mountains, near the Escaleras mill, long dikes, piled up, of smooth, rounded, bright granite stones, and flat beds of similar stones and boulders, alternating with patches of sand, exhibit striking evidences of the force of aqueous action. Farther in the ascent the features of the scene are on a grand scale. A mountain stream, from fifteen to fifty feet wide, and from two to four deep, descends through this section of the mountains to the mill of the Escaleras, and is several times crossed in the ascent; it then flows into the valley below, and irrigates the district of Famatina already described. The pass of the Escaleras is generally impassable during the winter months of June and July, the stream frozen, and the ravines blocked with snow and ice. I, however, succeeded, in the comparatively milder winter of 1826, though not without difficulty, in ascending by this route and gaining the summit of the Mexicana, having passed a night in the Cueva de Perez blocked round with snow during one of those terrific storms so common in these elevated ranges. Their approach is well known to the miners, from the gathering of masses of small dark clouds sweeping eastward over the Nevado; the arriero with his mules, to or from the mines, then hastens to gain shelter in the huts above or in the deep ravine beneath. These storms come always from the westward or south-westward: they sweep the ravines with furious gusts, which are succeeded by sudden momentary calms: they are generally confined to the upper regions of the mountains, without being felt at all in the valley of Famatina, where the weather may be serene and fine. The roofs of the low massive huts at the mines on the hill side, notwithstanding their being heavily laden with large stones, are sometimes blown away. In this remote and stormy region the poor miners lead a wretched existence: the spirit of gain, however, seems to set all difficulties at defiance. The highest part of the summit of the Mexicana, forming a point slightly elevated above the rest, called the *Espina*, is cut by a vein of silver-ore, which for several years has yielded a profit to its proprietor, D. Simon Herera, although worked at enormous expense. About seventy men were engaged in the working of this mine, and reducing the ores by amalgamation at the trapeche of Escaleras, distant forty miles from the mine. Another vein in the same elevation has been profitably worked by Senor Goriti; and there is also another mine, which has been badly worked, in which considerable quantities of rich ore are exposed to sight in the vein. The ore of this elevation is a black or greyish-black earthy sulphuret of silver, either pure, or more or less dispersed in a quartzose and hornstone gangue, and containing a proportion of gold sufficient to give the silver produced a yellow tinge. The average produce of the silver is 80 marks the cajon of 50 quintals from the mine of Santo Tomas in the *Espina* above mentioned. The other mines of this elevation yield an average from forty to fifty marks, with the exception of that of D. Isidore Carbajal, which yielded twenty-five marks. There is probably considerable waste in the reduction of the ores. An assay, by a skilful German assayer, of some of the *relaves*, or refuse of Santo Tomas, which had undergone amalgamation at the trapeche of the Escaleras, yielded in the ratio of thirty marks the cajon. The ores of this mine became latterly interrupted by a bed of pyrites. The veins of the Mexicana dip to the N.E. at an angle of about 70° to 75°; the dip of the veins in the other elevations ranges between 50° and 80°. The inclemency of this region of the Mexicana is excessive; so much so, that the endurance even of the Indian is put to the test. The other elevations more remote from the Nevado are more tolerable, the Morado being the mildest. Pleurisy often occurs, and the victim not unfrequently dies on the route during his conveyance to the valley. "*Padecemos, mas sufrimos,*"—"We suffer, but we endure," was their reply to my question respecting the climate of this region. This inclemency is, however, not attributable to the degree of cold merely, but to the increased nervous sensibility occasioned by the action of the puna affecting both the respiration and digestion, and rendering the cold less endurable. The puna is produced not altogether by atmospheric tenuity, although its action may be aided by this circumstance, since it occurs in widely different degrees at similar altitudes in these mountains. In the Morado its effects are comparatively slight—in the Mexicana extreme, although the altitudes differ little or nothing in relation to this phenomenon, which, I have little doubt, arises from certain mineral exhalations. This circumtance may account for some travellers having denied or thrown doubt upon its existence (vide Miers and others), while others relate of it the most startling examples (vide Miller's *Memoirs*, and the older voyagers in South America). The puna is not to be mistaken: it ordinarily produces a sense of weight in the head and limbs, hinders the progress of the pedestrian, as if his heels were lead, and sets him panting at a common walk, as if he were running a race: when considerable, it produces headache and nausea; when extreme, vertigo and vomiting. The complexion of the fresh-coloured European changes to a livid bluish tint; that of the Indian to a cadaverous yellow. In the Himalaya mountains a similar effect has been noticed; the cause is probably identical. The Mexicana exhales profusely sulphurous and other vapours: the clothes of the visitor at the mines become saturated with the effluvia, and it is probably as much owing to the puna as to any other natural obstacles that the Nevado is as yet unexplored, although conjectured to be rich in the precious metals. I suffered severely from passing a night in a low hut, half filled with snow, near the summit of the Mexicana, with nothing but my saddle and its usual accompaniments, and a blanket for my bed, although the previous night I had slept on the rocks of the lower summits in the pass of Santa Rosa in the open air, with snow around me, with but little inconvenience comparatively—so much more inclement was the Mexicana. On this account no native visits it from mere curiosity.

[Mahrattas.]

CASTES AND TRIBES OF INDIA.

In the latter half of the seventeenth century, in the reign of Aurungzebe, the last powerful and energetic monarch who ruled over the Mogul empire in Hindustan, there descended from the range of inaccessible hills which runs along the western coast of India fierce and wild bands of plunderers, whose devastating excursions spread dismay among the inhabitants of the neighbouring plains. They were the descendants of the Rajapoots, an old warlike tribe, who, being driven by the Moguls from the provinces of Hindustan, fled to the mountains of Western India. Inured to hardship, accustomed to the poorest fare, and armed with excellent sabres, they formed, like the Cossacks, with their hardy horses, a formidable cavalry, which was the terror of the neighbouring provinces. They were educated for war, and in battle intoxicated themselves with wild hemp, which they smoked like tobacco. In our recent contests with them their artillery was skilfully managed. The Mogul dynasty, after a brilliant existence of little more than a century and a half, was fast sinking into a state of paralysis and corruption, and these freebooters flocked like vultures round the expiring body. As they were Hindus, and professed the religion of Brahma, their standard had attractions for the patriotic as well as the greedy, and the Mohammedan power soon learned to tremble at their boldness and energy. Not being able in the early period of their power to maintain themselves in the countries which they ravaged, they laid them under contribution, and, for a fixed proportion of their revenues, exempted them from further incursions. This also gave them an opportunity of extending their devastations to new provinces, while the growing weakness of the Mogul empire rendered it incapable of protecting itself against a power which was destined in the end to be one of the chief instruments of its destruction. When Aurungzebe attacked the Coromandel coast, the inhabitants called in the Mahrattas, and he entered into a treaty very favourable to them; for though, it is true, he frequently defeated them in the plains, his efforts were ineffectual to rout them from their strongholds in the mountains. Sevajee, who may be considered as the founder of the Mahratta empire, having united the various tribes of which the nation was composed into a monarchy, died in 1682, and Aurungzebe put his son to a cruel death a few years afterwards. Aurungzebe himself died in 1707, when the Mogul dominion declined with frightful rapidity. The Mahrattas now extended their territories; their original country, though large, being wild and uncultivated. The capital of Sevajee's new kingdom was Sattarah. From robbers the Mahrattas became conquerors. The successors of Sevajee assumed the title of "Maha rajah" (grand prince). "Half the provinces of the empire," says Mr. Macaulay ('Edinburgh Review'), "were turned into Mahratta principalities. Freebooters, sprung from low castes, and accustomed to menial employments, became mighty rajahs. The Bonsls, at the head of a band of plunderers, occupied the vast region of Berar. The Guicowar, which is, being interpreted, the Herdsman, founded that dynasty which still reigns in Guzerat. The houses of Scindia and Holkar waxed great in Malwa. One adventurous captain made his nest on the impregnable rock of Gooti. Another became the lord of the thousand villages which are scattered among the green rice-fields of Tanjore."

Full of energy and audacity, bold, politic, and cunning, the Mahrattas had all the qualities which rendered them formidable to a power hourly decaying and becoming more imbecile. They gloried in rapid flight as well as in bold daring, and did not hesitate to

invite robbers and plunderers of all kinds to their standard. The real Mahratta possessed, however, in spite of a cruel and relentless disposition, a manly simplicity of character, which was generally retained even when fortune had raised him to the highest rank. His patience under privation in the field was, if possible, exceeded by his policy in the arts of dealing with men. At first the Mahrattas conciliated the proud and paid respect to the prejudices of the ignorant by affecting a sense of inferiority in the provinces which they had despoiled, and of which they were the real masters. In the height of their power their provinces stretched across the peninsula from sea to sea. We again quote the forcible language of Mr. Macaulay:—"Their captains," he says, "reigned at Poonah, at Gualior, in Guzerat, in Berar, and in Tanjore. Nor did they, though they had become conquerors, therefore cease to be freebooters. They still retained the predatory habits of their forefathers. Every region which was not subject to their rule was wasted by their incursions. Wherever their kettle-drums were heard, the peasant threw his bag of rice on his shoulder, hid his small earnings in his girdle, and fled with his wife and children to the mountains or the jungles, to the milder neighbourhood of the hyæna and the tiger. Many provinces redeemed their harvests by the payment of an annual ransom. Even the wretched phantom who still bore the imperial title stooped to pay this ignominious 'black-mail.' The camp-fires of one rapacious leader were seen from the walls of the palace of Delhi. Another, at the head of his innumerable cavalry, descended year after year on the rice-fields of Bengal. Even the European factors trembled for their magazines. Less than a hundred years ago it was thought necessary to fortify Calcutta against the horsemen of Berar; and the name of the Mahratta ditch still preserves the memory of the danger." The formidable confederation of the Mahrattas was put an end to in 1817, after a struggle maintained for many years against the British power in India.

On the death of Sambojee, son of Sevajee, the founder of the Mahratta empire, the nominal sovereign had no real power, and was in fact a state prisoner, while the government was administered by the Peshwa, or minister, residing at Poonah, who held them prisoners, and in whose family the office had become hereditary. The following concise synopsis of Mahratta history from this date, founded on Duff's 'History of the Mahrattas,' is taken from an article in the 'Encyclopædia Americana:'—

"The last of the royal family, Ram Rajah, ascended the throne at the age of eight years. His prime minister, the peishwah (grand vizier) Bajeerow, took advantage of the minority of the prince, seized the reins of government with the aid of Rajoojee, another minister, and confined Ram Rajah (who remained a prisoner till his death in 1777), though he left him a show of dignity. Bajeerow, with the other minister, then proceeded to divide the territories as independent sovereigns, the former assuming the western provinces, and fixing his residence at Poonah. His kingdom was called the empire of the Poonah-Mahrattas. Rajoojee took the eastern provinces, established his court at Nagpour, and founded the empire of the Berar-Mahrattas. Bajeerow died in 1761. The dignity of peishwah was hereditary in his family. But a council of government was formed in 1777, consisting of twelve Brahmins, which left the peishwah nothing but the executive power. This division of the Mahratta states could not be effected without the consent of the principal governors of the separate states; they were gained by additions of power and revenue. Hence many Mahratta princes arose, some of whom were only in appearance dependent upon the sovereigns of the more extensive districts, much as the German princes anciently depended on the emperor.—1. The empire of the Poonah-Mahrattas comprehended the whole coast from Goa to Cambay, and was surrounded by Mysore, Golconda, Berar, and the Mahratta principalities, Guzerat, Oojein, and Indore. It contains the most important possessions of the Bombay presidency. Bajeerow defeated the Mussulmans in 1760, and extended his conquests to the banks of the Indus This brought the Poonah-Mahrattas in contact with the territory under Abdallah, formerly a general of Nadir Shah. The peishwah having formed a plan for driving the Mohammedans out of the country, and extending the dominion of the Mahrattas over all India, the whole country was divided (1759-61) into two parties. The Mohammedans adhered to Abdallah, and appeared 150,000 strong in the plains of Carnaul and Paniput; the Mahrattas, together with the Jats, were 200,000 strong. After a long and bloody battle, the latter were defeated, and lost all hopes of the supremacy over India, which had been the object of the war. Bajeerow died soon after. His son Maderow died in 1772; his grandson Narain Row was assassinated in 1773, by his uncle Ragobah. The latter could not, however, obtain quiet possession of the peishwahship, for a posthumous child of Narain was acknowledged for his lawful son. Ragobah offered to the English the island of Salsette, on condition that they should support his claims. But the council of Bengal was unwilling to engage in a war with the Mahrattas; and, in 1766, concluded a treaty, by the terms of which Ragobah relinquished his pretensions: the English were to remain in possession of Salsette, and to receive a territory producing a yearly revenue of three lacs of rupees. Ragobah remained at Bombay; the English maintained that the district ceded to them did not yield the sum agreed upon. The friends of Ragobah had defeated the adherents of the young peishwah at Poonah, and the government of Bombay, with the consent of the council of Bengal, sent Ragobah, in 1778, with an English army to Poonah. The English gained many important advantages; but, on account of their war with Hyder Ali, peace was their chief object. It was concluded in 1782. They restored all the conquered countries except Salsette and the neighbouring islands. Maderow, the son of Narain Row, who had been assassinated, was born in 1774, and, in 1783, declared peishwah, and was for a time under the guardianship of one of the other Mahratta princes. Bajeerow, the last peishwah, was established by an English force, under the command of General Wellesley, now Duke of Wellington, and subdued several of the Mahratta tribes, with the assistance of the British armies; but in 1817 he commenced hostilities against the English. He was, however, so severely handled (November 16) by General Smith, that he abandoned his residence at Poonah, and fled to a mountain fortress. In 1818 he submitted to the British authority, and lived as a private individual, with a yearly pension, under the British inspection. 2. The state of the Berar-Mahrattas was not so deeply involved in foreign wars, but suffered more from domestic disturbances. Berar, the chief province, is two hundred miles long and one hundred and seventy broad. Rajoojee, some years after his expeditions with the peishwah against Bengal, wrested the best part of Orissa from Aliverdy, the usurper of Bengal. A shallow stream only separated the Berar-Mahrattas from Bengal, and they often made incursions into the frontier provinces of that beautiful region. These devastations were not checked until after Chossim Aly, nabob of Bengal, had ceded (1761) Burdwan and Midnapour to the English. Rajoojee, the first Berar rajah, after a long reign, left four sons. The eldest succeeded his

father, but died without children. The two next, Sebagee and Modagee, engaged in a war for the succession, in which the former fell, and the latter became rajah. He also assisted the Poonah-Mahrattas in the war against the British (1817), at first privately, but afterwards openly, and was obliged to submit, and to cede to the English his fortresses. Of the remaining Mahratta princes, the most important were Sindia and Holkar. The former was rajah of Oojein, and had become very powerful. To limit his growing power, war was declared against him by the British, in 1802, and he was defeated by the Duke of Wellington (then General Wellesley), September 23rd, 1803. He was obliged to consent to a disadvantageous peace, which was afterwards often violated. He died in 1827. Holkar, sovereign of Indore, whose revenue was estimated at 4,500,000*l.* sterling, was alternately the friend and enemy of the English. In the war of 1805 he was compelled to submit to disadvantageous terms. In 1817 he again took arms, but was defeated and obliged to submit, and deprived of two-thirds of his territories. He died in 1825.

"The subjugation of the Mahratta states was facilitated by the circumstance that the military caste of the rajahs was universally hated, because they treated the other castes as slaves. The property and rights of the latter found protection only under the British dominion. The caste of warriors left the British provinces in consequence, formed banditti (Pindarees) on the Nerbudda, and sought protection from the small Mahratta princes, who were jealous of the British."

The populations which the Mahrattas once scared live now in peace under the benignant sway of Britain.

LOCOMOTION OF ANIMALS.—No. I.

THE constitution of a vast assemblage of animals requires that they should possess the power of moving from place to place in search of food, and for a multitude of other objects incidental to their sphere of action.

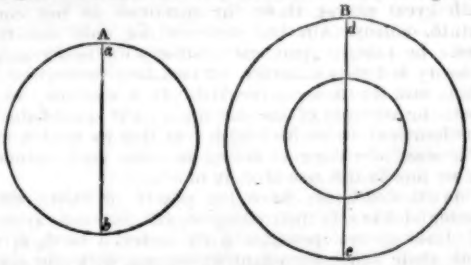
It is probable that most persons observe the ease with which animals traverse the earth, air, or sea, without bestowing the slightest reflection on the diversity of locomotive organs with which they are endowed in order to perform their several kinds of movements, or on the mechanical principles to which they are subordinate. We propose an inquiry into this subject, and commence by a brief exposition of the structure and mode of action of the locomotive organs of animals which move on solids.

It is requisite that the framework of animals which are destined to move on the earth should be more dense, and possess greater strength, to enable them to bear the shocks incidental to terrestrial progression, than that of those species which move in air, or water. The bony framework of the higher orders of animals, such as man and other mammalia, is composed of a great number of pieces which are hinged together at the joints in such a manner as to allow of more or less mobility, according to the purposes they are intended to fulfil. Thus, the legs and arms are united to the trunk by a ball-and-socket joint, a species of union permitting the greatest possible freedom of motion. The knee, elbow, and ankle, on the contrary, are furnished with the hinge-joint, which admits of motion backward and forward in one plane only; but, although the movements of these joints are thus in some measure restricted, greater precision is secured.

The vertebral column, which comprehends the bones of the back, is composed of a long chain of bones, acting as a flexible lever to support the head, neck, and trunk, and forming the connecting link between the several parts of the body. For this purpose, the movements of each of the several bones of the back upon each other are restricted; but, in consequence of the great number of joints with which the spinal column in man is furnished, it has a considerable degree of motion. The extremities of those bones which terminate in joints are tipped with a very hard, smooth, pearly-white, opaque substance, termed cartilage, lined with a delicate thin membrane, called the synovial membrane, which secretes an oily fluid into the joints, so that the limbs, in their movements upon each other, are protected from friction throughout the life of the animal.

The elastic cords which bind the bones together at their joints are termed ligaments, and such is their strength, that bones are often broken without the connected ligaments being torn or injured.

The long bones, which support the trunk of an animal above the surface on which it moves, are hollow cylinders, a form which presents a longer surface for the attachment of the muscles by which the limbs are moved, and confers greater strength with less expenditure and weight of material than if they were solid. It is found that the lateral strength of two cylindrical bones of equal weight and length, one of which is solid, and the other hollow, are to each other as the diameter of their transverse sections. For instance:—let *a*, *b*, *d*, *c*, figs. A, B, represent the figures of the two bones; then, the strength of the tube *d c* is to that of the solid *a b* as the length of the diameter *d c* to that of *a b*. In consequence

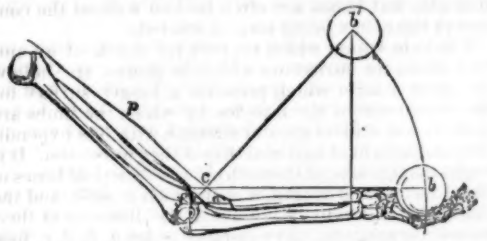


of this principle it was long since observed by Galileo that the strength of bodies is augmented in a thousand ways without increasing their weight; and that if a wheat-straw, which supports the ear which is heavier than the whole stalk, were made of the same quantity of matter, but solid, it would break or bend with far greater ease than is now found to be the case. The feathers of birds present, as well as the bones of animals, similar provision for the combination of strength, lightness, and economy of material. It must, however, be borne in mind that neither the strength of bodies nor the size of animals can be increased with the same quantity of matter without limit; because when the diameter of the tube exceeds certain dimensions, it becomes so thin and fragile as to break without offering any sensible resistance.

The bones, ligaments, and joints of animals are denominated the *passive*, and the muscles the *active* organs of motion. The bones serve the purpose of levers, which are acted upon after the principle of what is called the first, second, and third orders of lever, so named according to the relative positions of the prop or fulcrum, the power, and the resistance or weight.

The power of the muscles which move the limbs is so great that if the resistance to their action be sufficiently strong, they are often known to break the bones upon which they act. It is in consequence of the great force which the muscles are capable of exerting that

they are generally attached to the bones very near the axis of the joint about which the bone moves. The advantage of this disposition is, that a greater power of the muscle is made equivalent to a greater velocity in the movement of the limb. The action of the biceps muscle affords a good example of this principle. In the annexed figure we observe that this muscle *p* is attached to the bone of the fore-arm at *a*, very near the axis of the elbow-joint *f*, the effect of which is that in raising the weight in the hand *b* to *b'*, the muscle moves the point *a* only to *c*; but then, as the distance between *b* and *b'* is much greater than the distance from *a* to *c*, it is manifest that a very small contraction of the muscle is sufficient to produce a very great range in the movement of the extremity of the limb.



In this case the muscle is acting under a mechanical disadvantage owing to the obliquity of its direction, and its proximity to the joint; but, as it is endowed with great power, these circumstances do not constitute defects. On the contrary, not only can the limbs be moved upon each other with much more velocity, but the symmetry and beauty of proportion in the human figure are preserved. It is moreover said that a muscle cannot contract upon itself beyond about one-fourth of its entire length; so that its work must of necessity be done by acting in some such manner as we find in the case already mentioned.

As the muscles have the power of contracting throughout nearly their whole length, they are capable of drawing the moveable parts attached to them at both their ends; for example, we can, with the same set of muscles, either bend the thigh upon the body, or the body upon the thigh. If the muscles had not been endowed with the power to move the limbs under a mechanical disadvantage with the velocity they do, the sledge and the hammer, now so daily in use, would have been instruments of no value to the smith, nor the axe and hammer to the carpenter; and the numberless uses to which rapid motions of the limbs are applied must have been effected by some other means. The figure of the arm affords an illustration of the principles of the third order of lever; that is, the *power* of the muscle is applied between the *weight b* and the fulcrum *f*; and the power of the muscle *p* is to the weight *b*, as the length of the line *bf* to the length of the line *fc*: from this proportion we can readily find the power of the muscle when the weight is known.

THE HILL AND CASTLE AT NOTTINGHAM.

A TRAVELLER who passes along the Midland Counties Railway from Derby to Nottingham, when he approaches the last-named town cannot fail to see the abrupt and conspicuous hill which forms a kind of landmark on the south-west side of the town. This hill, or rather rock, rises almost perpendicularly from the northern bank of the little river Leen, and is surmounted by what was once Nottingham Castle. But it must be confessed that this castle, whether seen in its present ruinous state, or as it was a dozen years ago, does not and did not convey the idea which we are wont to attach to the word 'Castle.' When the history of a town goes back to times beyond the Conquest, and includes recitals of how this and that monarch defended himself in the Castle attached to it, we are apt to conjure up visions of a venerable embattled structure, majestic even in its ruins, with fragments of a 'keep' or 'donjon' in one place, a 'curtain' in another, and so forth; but the Nottingham Castle of our days is a Grecian structure.

If, leaving the market-place of Nottingham, we walk south-westward towards the Castle, we first encounter the entrance gates, the veritable gates of the old castle, which still remain standing in spite of the vicissitudes which the castle itself has undergone. Before entering these gates (which form the only adit to the summit of the rock), a walk of a few hundred yards will carry us entirely round the base of the rock on which the castle stands. This rock is perpendicular, or nearly so, only on the side next to the river: on the opposite side it slopes down gradually to the level of the town; and on the easiest part of this slope are the entrance-gates. When, proceeding to the left, we make the circuit of the rock, we meet with many small streets and lanes, whose names (as we shall see presently) bear testimony to some of the historical events for which the castle has been noted; such as "Edward," "Mortimer," "Isabella," &c. Then, coming down to the banks of the little river, we find the rock on the opposite side becoming more and more steep, until it at length appears nearly perpendicular. Many rooms and small houses have been built on the face of the rock itself, by excavating the scarped part; and above may be seen the castle, at a height of some two hundred feet. Passing onward, we meet with a collection of small gardens, occupying a spot of ground, once the moat or fosse of the castle, afterwards a fish-pond, but now producing an annual rental to the "lord of the castle," from the townspeople who hold the gardens. This is the lowest part of the circuit; and a little ascent brings us (always skirting near the base of the rock) to the road leading from Nottingham to Lenton. A portion of this road has been carried by a cutting through the rock on which the castle stands, so as to give to the latter an appearance of isolation more complete than would otherwise be the case. Shortly after this we reach the spot whence we started, near "Standard Hill," after having made the circuit of the castle and its rock.

The old gate of the castle is occupied by persons who conduct visitors, on the payment of a small fee. Within the gates is a grass-plot or court, once probably the outer quadrangle of the castle; and having crossed this, we ascend a flight of steps leading up to the terrace which surrounds the castle, and on the level of which it stands. Here, glancing upwards at the bare and blackened walls and windows, and within at the heaps of stones, we witness a sad memorial of the mischief which an ungoverned multitude has effected. When we approach that side of the terrace which is nearest to the scarped cliff, we obtain an extensive and really beautiful view of the country around. All the south-west parts of the town lie spread out before us; with their factories, the railway, the little river Leen, the canal, the Trent at a small distance, the villages of Radford and Lenton, the gardens occupying the *ci-devant* moat and fish-pond below, and the blue outline of the Derbyshire hills in the distance.

We are told by the local historians, that the name of Nottingham has been derived from "Snottinga-ham," or "Snodengaham," signifying in the original Saxon the "place of caverns;" in relation, as is supposed, to numerous caverns and subterraneous dwellings excavated in the sandy rock on which it was situated.

According to the Saxon chronicle, the Danes, having in one of their numerous predatory incursions made themselves masters of the town, in 868, were attacked by Burrhed, king of Mercia, who, having obtained the assistance of King Ethelred I. and his brother Alfred, afterwards Alfred the Great, compelled the invaders to conclude a treaty of peace, and to retire to York. Subsequent disasters of a similar kind led to the fortification of the town by means of a wall, by Edward the Elder, about the beginning of the tenth century. Some fragments of this wall are said to be still visible on the side of the hill above Narrow Marsh.

In the time of the Conqueror, when the town of Nottingham was found to contain one hundred and twenty burgesses, a castle was built on the summit of the hill, on the site of what had been an ancient fort: this castle was to overawe the townspeople, and was given to William Peveril, a natural son of William. From the strength of its structure and the boldness of its position, the castle was for some time deemed impregnable; but during the wars between Stephen and Matilda it was taken by the Earl of Gloucester, who at the same time plundered and burnt the town; and under the reign of John, it was unsuccessfully attacked by the confederate barons.

The reign of Edward III. brings us to the period which has given an interest to the rock itself, as well as to the castle which stood on it. When we are on the terrace of the (present) castle, we find a small and nearly-concealed flight of steps leading down to subterranean passages through the body of the rock. These passages have a very curious appearance: cut in a kind of sandstone, which constitutes the hill, their sides and floor have a good deal crumbled away, and what were once steps is now only an irregular inclined plane. The passages wind in various directions, always descending, and are lighted here and there by irregular loop-holes cut in the surface of the rock. Along the sides of the passages, in some parts, are hemispherical cavities, said by the attendant *cicerone* to have been excavated to contain the cannon-balls stored away for the use of the defenders of the castle in disturbed times: with what correctness we cannot say. Some of the passages are now blocked up, either designedly or by the falling down of sandstone fragments from the roof and sides; but there can be no doubt that they led down originally nearly or quite to the level of the little river beneath: and it is a safe conclusion that they were formed artificially as a secret exit from the castle, in accordance with the crafty and cautious arrangements of disturbed periods.

This subterraneous passage bears a name ("Mortimer's Hole") which points to the occurrence connected with its history. How Edward II. was murdered in Berkeley Castle by the machinations of his queen Isabella, and her paramour Mortimer, is familiar to all who have read English history; nor is it necessary to detail the struggle which the guilty pair had to maintain against the youthful monarch Edward III. and his supporters. Suffice it to say, that on October 20th, 1330, the young king, together with Isabella and Mortimer, were in Nottingham Castle, and that the king's partisans had resolved to seize forcibly on Mortimer, who had wrought such mischief in the country. The result is related by Hume, but rather more in detail by Lingard, as follows:—"Mortimer had taken every precaution for his security. A strong guard lay within the walls; the locks of the gates were changed; and the keys were taken every evening to the queen's chamber, and laid on her pillow. Montacute (one of the king's party) found it necessary to make a confidant of Sir William Eland, the governor, whom he first swore to secrecy, and then acquainted with the royal pleasure. Eland replied that there was a subterraneous passage, leading from the west side of the rock into the Castle, which was unknown to Mortimer, and through which he would introduce any number of the king's friends. Montacute, with his associates, fixed the hour, and rode into the country; and the favourite, who had received some dark hints of a conspiracy against him, attributed their departure to an apprehension that their design had been discovered. In the afternoon he informed the council that an attempt to oppress him and the queen-mother would soon be made by the exiles abroad, in union with Edward's most intimate acquaintance at home. He even charged the king with being privy to the plot, and refused to give credit to his denial. Before midnight, Montacute and his friends returned; Eland admitted them by the subterraneous passage; and they were joined by Edward in the staircase leading to the principal tower. They mounted in silence till they heard the sound of voices in a room adjoining to Isabella's apartment, where Mortimer was engaged in consultation with the Bishop of Lincoln and his principal advisers. The door was instantly forced, and two knights who endeavoured to defend the entrance were slain. The queen, alarmed by the noise, and conjecturing its cause, exclaimed, 'Sweet son, fair son, spare my gentle Mortimer!' But her fears would not permit her to remain in bed. She burst into the room, crying out that he was a worthy knight, her dearest friend, her well-beloved cousin." It was, however, in vain: Mortimer was captured, tried for high treason, and executed.

Nottingham Castle from time to time occupies a place in the history of the subsequent reigns, sufficient to indicate its continued existence. Thus we find, that in Edward III.'s reign a parliament was held here; that David Bruce, who had been made prisoner at the battle of Durham, was for some time confined in the castle previous to his removal to London; that in 1386 a council was held here by Richard II., which led to violent disputes between the ministers and the parliament; that in 1461, Edward IV., after landing at Ravenspur, assembled his forces at Nottingham, and made extensive additions to the castle; that Richard III. further improved the castle, and marched thence with his forces to Bosworth Field; and that Henry VII. held a council of war here, previously to the battle of Stoke.

In Charles I.'s reign, when the contest between the king and the parliament commenced, Charles set up his standard on a hill within the limits of Nottingham Castle. Just without the present boundary of the castle grounds there is an inhabited street or terrace called "Standard Hill," which marks the spot where this occurrence took place. All the particulars of this planting of the royal standard are given with more than sufficient minuteness, in a pamphlet published at the time under the title of 'A true and exact Relation of the Manner of his Majestie's Setting-up of his Standard at Nottingham, on Munday the 22 of Aug., 1642.' Some time afterwards the castle was taken by the Parliamentarians; and during the Protectorate it was dismantled and almost demolished. After the Restoration it passed into the Duke of Buckingham's hands, and from him to the Duke of Newcastle, who pulled down the remains of the castle, and built the mansion whose deserted walls now meet the eye. The time for intestine wars was passed; and the duke substituted a private mansion for a military castle. It was at this mansion that, in 1688, the Earl of Devonshire and other noblemen met to concert measures for the support of the Prince of Orange. The building was nearly destroyed in 1831 by a mob; and as it was left after that tumult, so it remains to the present day.